日時：2015年　7月16日（木）16:00～
場所：東北大学　工学部　化学･バイオ系中講義室
16:05-16:20 千葉一裕　教授　　東京農工大学の紹介
16:20-17:10 Esko Kauppinen教授　講演

# Gas Phase Nanomaterial Synthesis: SWNT Thin Films for Flexible Electronics Applications and Particles for Inhalation Drug Delivery

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We introduce our results on single walled carbon nanotube (SWNT) direct, dry deposition (DPP, direct dry printing) from the floating catalyst chemical vapor deposition synthesis (FC-CVD) reactor at ambient temperature and pressure to manufacture flexible and transparent conducting films (TCF) and field effect transistors (TFT-FET). High quality SWNTs with tunable diameter, length and bundle size have been produced from carbon monoxide (CO) using Fe cluster catalyst produced via ferrocene thermal decomposition in laminar flow of CO. State-of-the-art flexible SWNT-PET conducting films (1,2,) show transparency-sheet resistance properties surpassing those of ITO-PET films with sheet resistance down to 60 ohms/sq at 90 % transparency. We demonstrate the use SWNT transparent films as capacitive touch sensors for mobile devices as well as electrodes for OLED and solar cells. In addition, we show that the control of nanotube bundling during the synthesis is needed for the production of high quality TCFs and TFT-FETs (3).

In addition, we present the novel gas phase method to produce peptide-coated micron particles for inhalation drug delivery applications. We start by atomizing the drug molecule or drug nano-colloid -leucine solution into an aerosol, which is then fed into the laminar flow, hot wall aerosol reactor. After the solvent evaporation leucine segregates onto the solid drug particle surface. When heating even further i.e. above the leucine evaporation temperature, leucine evaporates and finally condenses heterogeneously onto drug particle surface when cooling the flow e.g. via convection or dilution at the reactor outlet. Accordingly, we produce drug particles with controlled leucine nanocoating at the surface (4). To demonstrate the method for multicomponent drug system, we prepared stable and well-dispersible pulmonary fine powders composed of combination drugs with different water solubility, to facilitate concomitant release of corticosteroid budesonide and short acting agonist salbutamol sulphate and to improve the dissolution of the budesonide. The budesonide nanosuspensions were prepared by a wet milling which were mixed then with salbutamol sulphate, mannitol (bulking material) and leucine (coating material) for the preparation of micron-sized particles by an aerosol flow reactor wherein leucine formed a rough coating layer on particle surface. The stable and intact particle assemblies showed excellent aerosolization performance. We present recent results on the formulation of synthetic peptide and green tea extract molecules for inhalation delivery.

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